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ON THE

TORSION

OF

BLOOD-VESSELS.

BY

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Presented by Dr. R. McDonnell

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ON THE TORSION OF BLOOD-VESSELS.

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TORSION, as a means of stopping bleeding from arteries, has a much higher value in the present day than when Amussat proposed it. The introduction of anæsthetics has made surgeons less desirous to complete their operations with the least possible delay. They now look more to a safe and speedy convalescence; hence, all means of treatment which promote the healthy and rapid healing of wounds are, at present, more thought of than the actual celerity of what goes on in the operation theatre.

It is because of its being an important adjunct to the antiseptic method of treating wounds that those practitioners who have gained confidence in the use of it are anxious to see the torsion of arteries generally adopted.

It is the combined result of the use of anæsthetics, antiseptics, and torsion which is so gratifying to the surgeon, because it affords so much a better prospect of getting union by the first intention.

It is probable that before many years the use of the silk ligature will be altogether superseded. Even now it is only those surgeons who are "conservative" in the unprogressive sense who adhere to its use. The choice among those who belong to the party of progress lies between the use of torsion and that of the carbolized catgut ligature cut off short after the fashion of Professor Lister.

The object of the present paper is to give short practical details as to the best mode of applying torsion to vessels under different circumstances, as to size, surrounding tissue, etc. It is therefore unnecessary to enter into the history of the subject further than this: In the year 1829, M. Amussat made his well-known communication on the subject to the Académie Royale de Médecine. The practice which he recommended was adopted by some of the leading French and German surgeons of the day (Boyer, Dupuytren, Velpeau, Lieber, Fricke, Schrader, etc.). British surgeons did not for some years take any notice of the subject. In 1834, Mr. W. B. Costello published a paper in the *Lancet* "On the Torsion of Arteries for the Purpose of Arresting Hæmorrhage," but the practice was not followed. It was

only a few years since, after Sir James Simpson had written extolling acupressure as a means of arresting hæmorrhage, that in a short note in the *Lancet* Professor Syme brought back the attention of the profession to the subject of torsion. It is probable, therefore, that the revival of this practice was really due to the rivalry existing between these two distinguished professors of Edinburgh. It is, however, unquestionably to the exertions of Mr. Thomas Bryant, of Guy's Hospital, and Professor Humphry, of Cambridge (England), that torsion is now becoming an established practice.

Since the appearance of Mr. Bryant's memoir on the subject, in the *Medico-Chirurgical Transactions*, 1868, it has been practised by my colleagues and myself in Dr. Steeven's Hospital, Dublin. As this is the largest surgical hospital in this city, we are therefore, after so many years' experience, entitled to speak with some authority on the subject.

I quote, therefore, with great satisfaction, the words of Mr. Colles, as expressing our joint experience :—

"For the last six or seven years," he says, writing on the subject in the *Irish Hospital Gazette*, "in Steeven's Hospital, my colleagues and I have seldom resorted to any other means of arresting hæmorrhage, even from the largest vessels, and we have never had reason to regret the adoption of the practice."

Any one desirous of making himself expert in the art of arresting bleeding by torsion should begin by making a few experimental trials on vessels taken from the subject. One or two simple principles are thus learned. Suppose we take a few inches of the femoral or brachial artery cleanly dissected out from a recently dead subject. The end of the vessel is caught hold of by a pair of forceps (closing with a spring-catch or bolt), broad enough *to catch the entire mouth* of the vessel. By means of a second pair of forceps, such as will be presently described, the vessel is seized at right angles. This second pair of forceps consists of two blades, such as are figured at fig. 1. A projecting ridge on one blade fits into an indentation on the other. Seized transversely in this second pair of forceps, the vessel is squeezed tightly, and thus its internal tunics are nipped across while its outer coat, which is much tougher, is not. The second pair of forceps have now done all that is required of them, and the twisting is accomplished by the first pair, the vessel being overlaid and twisted at the point where the inner tunics have been nipped through. It is curious and indeed interesting to observe what happens as the twisting is continued. The inner tunics actually peel off, and double up, becoming invaginated in the vessel ; the external tunic twists into a


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firm cord with little or no tendency to untwist. The appearance of this invagination of the inner tunics is well represented by Mr. Bryant in the illustrations accompanying his paper already alluded to. It was however, admirably figured long before by P. J. Manec in his work, "De la Ligature des Artères," 1832 (Plate xi., figs. 2, 3, 4 and 5).

A few trials, however, on the arteries of the dead subject, and a careful inspection of the result, will do more than any illustration to satisfy the surgeon of the security which arises from the peculiar mode in which torsion obstructs the end of an artery. I would venture to assert that no surgeon who will take the trouble of investigating the matter by a few experiments of this kind will long resist the practice.

It is obvious that torsion is not to be applied to all kinds of vessels in exactly the same manner. Experience teaches that we must adopt somewhat different expedients in securing by torsion vessels differing in size and position; the greater or less laxity of the tissue which surrounds the vessel, the character of its sheath, etc., all make it necessary to modify somewhat the mode of procedure. The surgeon should have at hand, therefore, several varieties of torsion forceps, since a pair well suited to twist one vessel may not answer so well for another.

Perhaps the simplest and most practical mode in which I can hope to convey to those who have not as yet learnt the mode of torsion for themselves, some idea of the details of the practice, is by describing as accurately as I can how it may be done on different vessels:

First, then, vessels met with in amputations of about the size of the radial or ulnar are easily secured. They are best twisted by the aid of toothed forceps, such as are here represented (fig. 3). These forceps are, I believe, generally known as "Syme's torsion forceps." The vessel is to be seized right across its open mouth. and drawn out a little; it is then caught just beyond the forceps, between the thumb and forefinger of the left hand, so that the nail of the thumb may give it a good pinch, and nip through the internal tunics; then twist and all is secure. The end may in the case of such vessels be twisted off or not, as the operator pleases. If the forceps catch the vessel by the lip only, or at the side, it will of course continue to bleed. In order to be successful the vessel must be caught entirely across the mouth, and the outer tunic must be twisted. as seen diagrammatically represented at C, fig. 5.


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Secondly. If the vessel be surrounded by a large quantity of lax areolar tissue, as in the scrotum, prepuce, around the eyelids, or in the loose tissue forming the bed from which a fibrous tumor has been removed, the forceps last figured (fig. 3) do not answer well. The

teeth project too much. When twisted they catch in the loose areolar tissue, as a corkscrew would if twisted in tow: this prevents the proper twisting of the vessel itself at one point, viz., where the inner tunics are divided by being nipped. For vessels of this sort such forceps as are here figured (fig. 2) are very good. As before, the vessel is to be caught across the mouth, if possible, nipped by the nail of the thumb of the left hand, and twisted so that the external tunic is overlaid at the point where the nip has been made.


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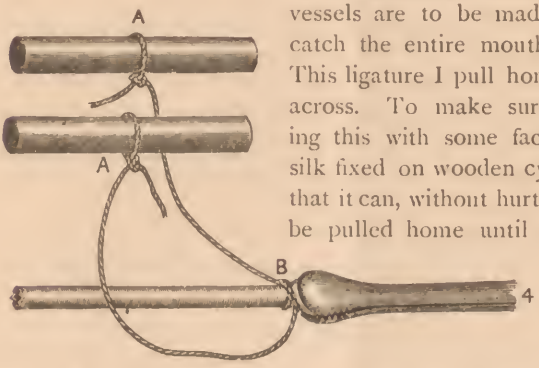
Thirdly. Vessels lying in muscular tissue are sometimes troublesome to secure by twisting. This is not so when, as in the face of a stump, the vessel can be fairly and completely caught by the mouth. Here muscular branches of an artery are as readily secured as other vessels. But suppose, for example, that a breast has been removed, and the great pectoral exposed; a bleeding point on the muscle is seized and twisted; the part seized tears away readily and leaves a little pit bleeding more than before. The vessel has in truth been caught sideways, and a piece torn out of it all the more readily, because the muscular tissue in which it is imbedded is friable. The difficulty in these cases arises from the fact that where we have to deal with a longitudinal and not a transverse section of a muscle there is more trouble in making sure that we catch the vessel right across the mouth. If it be scraped with the handle of a scalpel, perhaps if need be rather roughly, so as to let the vessel be distinctly seen, and caught not longitudinally but transversely across the mouth, the twisting may be performed as readily as on any other vessel.

Fourthly. Some special difficulty may be experienced in securing by torsion vessels which lie deeply between bones, and in the close vicinity of a dense membrane, as the interosseous arteries in the forearm and leg. In this case the vessel must be detached carefully, either by the handle of the scalpel or by dissection, from its surroundings. Obviously, if in seizing such a vessel the interosseous membrane is also taken hold of by the forceps, successful twisting would be impossible. From this membrane the vessel must be completely separated.

Fifthly. Such vessels as the brachial, femoral, or popliteal, are in general very readily secured by torsion; in the great majority of instances it is only necessary to attend to the principles already laid down, viz.: 1st, to catch the vessel clean across the mouth; and 2d, to divide by some means the inner tunics, and twist the outer coat at that point (c, fig. 5.). In all cases of amputation for injuries, where the tissue around the vessel is healthy, it is usually quite an easy matter so far to detach it from the adjacent parts as to accomplish in

a few seconds all that is necessary. If, however, we are amputating in the neighborhood of diseased structures, sinuses, etc., where the

parts are matted together, it is necessary by some touches of the point of a scalpel to free the vessel from the surrounding parts. Even then it cannot be drawn out as in the former case. The parts around are unyielding, and it is by no means easy to get space enough beyond the ends of the first or grasping forceps to apply the second or nipping forceps. Under these circumstances I adopt the following expedient, illustrated diagrammatically in fig. 4. I place a silk ligature round the vessel (B, fig. 4), immediately beyond the ends of the grasping forceps (which for large vessels are to be made big enough to catch the entire mouth of the artery). This ligature I pull home until it snaps across. To make sure of accomplishing this with some facility I have the silk fixed on wooden cylinders (A A), so that it can, without hurting one's fingers, be pulled home until it snaps across. It invariably snaps at B, and is to be pulled off and cast aside. We thus accomplish by a snapped ligature what is done in other cases by the nipping forceps, and then proceed to twist; three or four half-turns are sufficient for the femoral, and I always in this case leave the end still adhering. If the wound is washed with chloride of zinc solution, or otherwise properly antisepticized with carbolic acid water, etc., these portions do not act as foreign bodies, but are absorbed as Lister's catgut ligature is.



The mode which I now propose, and which I have over and over again put in practice, of using a silk ligature, not too strong, pulled home until it breaks, for the purpose of dividing the inner tunics of the vessel previous to twisting, is very simple, and, I may add, very effectual. It supplies the place of the nipping forceps, or the thumb nail, and is applicable to vessels of all sizes which are unmanageable in other ways.

In fact, no readier way of securing ordinary-sized arteries can be suggested than to put on, first, a silk ligature, and then seize the

knot in a pair of torsion forceps and twist it off. The vessel is perfectly secured, and there is no foreign body left behind in the wound. Large wounds are often then found healed on the twelfth to the fourteenth day; that is about the time that, in cases where a bundle of ligatures have been left in a wound, these are beginning to separate.

Some ingenious instruments have been devised for performing with a single instrument the double manœuvre of nipping the coats and grasping the vessel to twist it. Among these I would mention a kind of forceps invented by Dr. Addinell Hewson, Surgeon to the Pennsylvania Hospital, in Philadelphia. Dr. Hewson was good enough to present me with a pair of these forceps last year, when I had the pleasure of visiting his city. I have since then had several opportunities of using them, and found them do their work satisfactorily on vessels not surrounded with brawny, tough, infiltrated structure. Where, however, this condition exists, or, in fact, wherever there is any difficulty in drawing the vessels out a little from the surrounding structures, Dr. Hewson's forceps are open to the same objection as arises in attempting to use the cross-nipping forceps. There is not space enough to apply them, and to nip properly beyond the ends of the grasping forceps. The advantage of the ligature pulled until it snaps and comes away, is simply that we can in this way accomplish all we wish to do as regards dividing the inner coats upon a very limited piece of the artery.

It will be admitted that experience alone can give one confidence in this mode of arresting bleeding from large vessels. Practice can only make one expert in the performance of torsion. But it will, we feel confident, repay those who bear the first anxiety, and take the trouble.

There can be no more gratifying spectacle for a surgeon than to see a large wound (as after extirpation of a breast or amputation of a thigh) closed up without a single ligature remaining to interfere with primary union. Anæsthesia, torsion, and antiseptics, with catgut sutures, etc., seem to render almost perfect the healing of wounds after operations.